

This 1820 plate is one of a number by William Scoresby, a whaler's son who was the first person to draw and describe whales accurately.

CETOLOGY

How science inspired *Moby-Dick*

Philip Hoare tracks the scientific influences and insights that breach throughout Herman Melville's epic novel.

More than a century and a half after it was published, Herman Melville's *Moby-Dick* remains a key cultural bridge between human history and natural history — expressed in the vast and ominous shape of the whale. This epic novel is a laboratory of literature, created in an age before art and science became strictly demarcated.

Melville wrote his book — which drew on his own youthful experiences on a whaling ship — as a tribute to the first period of modern whaling in the eighteenth to mid-nineteenth centuries, which he claimed to be worth US\$7 million a year to the fledgling United States. At the same time, science was undergoing a sea change as the gentleman scientists and polymaths of the century's start gave way to more specialized and professionalized successors.

Melville's attitude to, and use of, science in *Moby-Dick* was in line with the eclectic ethos of that period. Drawing on the work of luminaries such as William Scoresby, Thomas Beale, Georges Cuvier and Louis Agassiz, Melville used contemporary knowledge of natural history — or the lack of it — to his own ends.

Seventeen of the book's 135 chapters focus on whale anatomy or behaviour. Titles

Moby-Dick
HERMAN MELVILLE
Harper & Brothers:
1851.

include 'The Sperm Whale's Head — Contrasted View' and 'The Right Whale's Head — Contrasted View'; such sections lay out the whales' physical structure with a wry mixture of known facts and arch analogy. (In a witty 2011 essay, marine biologist Harold Morowitz speculates on Melville as a "cetacean gastroenterologist or proctologist".) Melville's must also be the first, and perhaps last, work of literature to feature a chapter on zooplankton.

In the famous Chapter 32, 'Cetology', Melville attempts to categorize species of whale as he would catalogue his library, in 'folios'. It was a playful gesture that reflected the fluid classification of cetacean species at the time. In *The Natural History of the Sperm Whale* (1839), Beale notes that the French natural historian Bernard Germaine de Lacépède claimed that there were eight species of this whale; there are in fact only three: *Physeter macrocephalus*; *Kogia sima*, the dwarf sperm whale; and the pygmy, *K. breviceps*. Accordingly, Melville pronounces earlier attempts to describe whales "all wrong",

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For more on the scientific history of whaling, see: [go.nature.com/7ykg2n](https://www.nature.com/7ykg2n)

and deploys two contemporary authorities to bolster his claim: Scoresby and Beale.

The Natural History of the Sperm Whale was the first attempt to write scientifically about this deep-diving, open-ocean whale. The result of Beale's experiences as a surgeon on a British whaling ship, the book was full of observations on the animal's anatomy and behaviour. Cuvier had claimed that the sperm whale struck fear into "all the inhabitants of the deep", but Beale knew this whale to be "a most timid and inoffensive animal".

Equally, Scoresby's groundbreaking *An Account of the Arctic Regions* (1820) gave Melville insight into the other cetacean whose numbers were decimated by whaling: the bowhead (*Balaena mysticetus*), then known as the common whale. Scoresby, the son of a whaler, was a typical polymath of the time: hunter, scientist, clergyman and mesmerist. In his early career he had received encouragement from Joseph Banks, and his work set the benchmark for Arctic studies.

Melville was particularly fascinated by Scoresby's observations of an ancient Inuit harpoon embedded in a bowhead's blubber. "Who had darted that stone lance?" Melville's narrator Ishmael wonders, imagining (with slight exaggeration) that it had been thrown "long before America was

discovered”. Science indicates that Melville may not have been far wrong. In 1999, tests on bowheads indicated that these animals can live for at least 200 years.

Of course, the greatest scientific figure of the age hovers over Melville. Darwin published *On the Origin of Species* in 1859, eight years after *Moby-Dick* came out. Melville’s sole mention of Darwin is a quote — from *Darwin’s Voyage of a Naturalist* (sic) — in the extracts at the start of *Moby-Dick*. He had read Darwin’s *Voyage of the Beagle* (1839) in preparation for his own 1854 work, *The Encantadas or Enchanted Isles* — as the Galapagos were then known. Melville visited the islands in 1841, six years after Darwin’s fateful landing. Darwin’s recorded observation of marine iguanas as “imps of darkness” seemed to set the tone for Melville’s metaphorical view of the Galapagos, which he saw as “five-and-twenty heaps of cinders ... In no world but a fallen one could such lands exist”.

Such dark analogies are in line with a man who declared all human science to be “but a passing fable” — and yet created a fable of his own. In *Moby-Dick*, Ishmael is a perpetually sceptical and questioning figure, a man attuned to science — a stark contrast to the vengeful Ahab and his pursuit of the whale that “dismasted” him. As the critic Eric Wilson, in his essay ‘Melville, Darwin, and the Great Chain of Being’, notes, a “primary subtext of Melville’s novel is the passing of pre-Darwinian, anthropocentric thought, espoused by Ahab, and the inauguration of

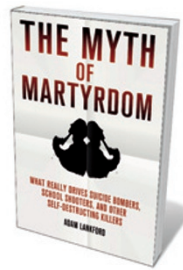
“Melville’s masterpiece resonates powerfully with today’s scientific concerns.”

a version of Darwin’s more ecological evolution, proffered by Ishmael”.

Melville lived through that process. US Transcendentalist Ralph Waldo Emerson’s essay *Nature* (1836), with its declaration of moral law at the heart of the cosmos, was the new philosophy of Melville’s youth. But as biographer Andrew Delbanco points out, Melville read *A Hazard of New Fortunes* (1890), William Dean Howells’s Darwinian-inflected view of society. *Moby-Dick* itself has been seen as a parody of the Transcendentalists’ ‘back-to-nature’ excesses. But Melville does more than lambast philosophy or use science as interior decoration. He achieved a marvellous synthesis of his own poetic and philosophical impulse with the increasingly science-aware ethos of his age. And he did so with a sense of black humour that transcended Transcendentalism to prove that nature — and its science — was much stranger and more wonderful than they had imagined.

Moby-Dick failed to make any impact in Melville’s lifetime, and he died forgotten in 1891. But his spirit of enquiry and experiment stood him in good stead as far as ▶

Books in brief



The Myth of Martyrdom: What Really Drives Suicide Bombers, Rampage Shooters, and Other Self-Destructive Killers

Adam Lankford PALGRAVE MACMILLAN 272 pp. £16.99 (2013)

Are suicide bombers psychologically normal? Many psychologists, including experts ‘diagnosing’ the hijackers responsible for the 11 September 2001 terrorist attacks, view them as just that, albeit exercised by a powerful sense of justice. Adam Lankford begs to differ. Self-destructive killers, he says, are already primed for suicide — so depressed, addicted or brutalized that it is relatively easy to tip them over the edge. A criminal-justice specialist, Lankford presents compelling, well-synthesized evidence for his case.



The White Planet: The Evolution and Future of Our Frozen World

Jean Jouzel, Claude Lorius and Dominique Raynaud. Translated by Teresa Lavender Fagan PRINCETON UNIV. PRESS 316 pp. \$29.95 (2013)

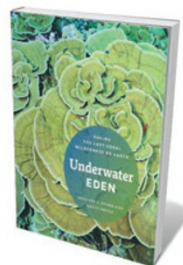
Ice in all its chill Earthly manifestations has drawn thousands of research scientists into the white deserts of the world. Now, three pioneers of ice-core science — Jean Jouzel, Claude Lorius and Dominique Raynaud — reveal key facets of the cryosphere in a new translation of their sweeping overview. Moving from exploration and early science, they delve into the ice ‘archives’ and findings on climate ancient and current, the rise of pollution and more. A nuanced and thorough look at climate change and its implications.



The Enlightenment Vision: Science, Reason, and the Promise of a Better Future

Stuart Jordan PROMETHEUS 295 pp. \$26 (2013)

Physicist Stuart Jordan scrutinizes the afterglow of that scientific big bang, the Enlightenment of the seventeenth and eighteenth centuries. Aspects of today’s culture — medicine, scientific outlook, democracy and technological advances — carry traces of the original vision. But Jordan shows too how mixed a legacy we face, from ignorance about science, a bulging population and “juggernaut technology” to degraded ecosystems. Particularly by upholding ethics, he argues, we can collectively turn the tide.



Underwater Eden: Saving the Last Coral Wilderness on Earth

Gregory S. Stone and David Obura UNIV. CHICAGO PRESS 184 pp. \$40 (2012)

Ocean warming and acidification are bad news for corals, and more than one-quarter of fish species. So when Gregory Stone dived around the remote Pacific Phoenix Islands in 2002, he was stunned to see a ‘lost world’ of untouched coral beds. Here Stone, chief ocean scientist of Conservation International, coral researcher David Obura and contributors lay out what happened next: the hard-won creation of the largest World Heritage Site ever sanctioned by the United Nations Educational, Scientific and Cultural Organization.



This Explains Everything: Deep, Beautiful, and Elegant Theories of How the World Works

John Brockman HARPER PERENNIAL 432 pp. \$15.99 (2013)

Agent to the stars of science, John Brockman presents mind-bites from his stable of research heavyweights asked to name their “favourite deep, elegant, or beautiful explanation”. Try theoretical physicist Freeman Dyson speculating on the putative coexistence of quantum and classical world views, or mathematician Samuel Arbesman admiring the reaction–diffusion model that dictates a leopard’s spots.



Moby-Dick author Herman Melville.

▶ literary immortality is concerned. His allusive style chimed with a new century of discovery, and twentieth-century experimentalists of literature such as D. H. Lawrence and Virginia Woolf reappraised him as a modernist who lived before modernism was invented.

Melville's masterpiece also resonates powerfully with today's scientific concerns. *Moby-Dick* contrasts the glory of the whale with the threats posed by humanity. Melville even seems to anticipate the effects of a changing environment. In the moving chapter 'Does The Whale's Magnitude Diminish? — Will He Perish?', Melville wonders about a flooded future, but sees the whale as triumphant, spouting "his frothed defiance to the skies". Yet by the time his book finally came into its own, Melville's vision had turned into a nightmare for the whale.

In 1961 alone, more whales died — nearly 75,000 — than in the entire span of Yankee whaling. With faster ships and grenade harpoons, new species had come within the hunters' remit: the blue and fin whales of the South Atlantic and Southern Ocean. And, like Scoresby, the "hip-booted cetologists" (as D. Graham Burnett describes them in his *The Sounding of the Whale: Science and Cetaceans in the Twentieth Century*, University of Chicago Press, 2012), entered a complicit arrangement with the modern whaling industry to inform their conclusions on whale anatomy, breeding and migration. It is telling, perhaps, that no one has written a follow-up to *Moby-Dick* to celebrate that particular adventure. ■

Philip Hoare is the author of *Leviathan*, or, *The Whale*. His new book, *The Sea Inside*, is due out in June. He is co-curator of the *Moby-Dick Big Read* (www.mobydickbigread.com), an online project hosted by Plymouth University, UK. e-mail: phoare@themovement.demon.co.uk

INNOVATION

Motley inventors

John Browning welcomes a collective portrait of creators that puts life stories first.

An enthusiast's book about enthusiasts, *The Tinkerers* surveys a motley collection of US innovators whose creations are changing the world — or so their makers hope. The result is a kaleidoscopic view of the myriad forms innovation can take.

Alec Foegen's book is a useful contribution to understanding our era, repeatedly transformed by innovation that has generated pages and gigabytes of analysis in the abstract, but surprisingly little on the inventors themselves. Foegen redresses the balance, covering a crew that ranges from Thomas Edison to Silicon Valley whizz-kids. He tries to let his inventors describe in their own words what they thought they were doing, and why.

Dean Kamen, inventor of the Segway and various medical devices, falls closest to the mould set by Edison. Based in New Hampshire, he has used the cash flow from licensing his automatic syringe, dialysis machine and other medical innovations to invent solutions to whatever takes his fancy — such as a wheelchair that can navigate steps. Saul Griffith puts a more modern spin on the model. His "do tank", Squid Labs in Alameda, California, spins off companies rather than licences — including Howtoons, a website featuring educational cartoons, and Makani Power, which uses airborne wind turbines to harvest the energy of high-altitude winds.

Meanwhile, Nathan Myhrvold, Microsoft's former head of technology, takes new models of innovation to a logical extreme. Instead of creating his own inventions, his company, Intellectual Ventures, buys, finances and creates a large patent portfolio, which it then licenses to others. He argues that this inspires a broad swathe of creativity. Some, in turn, argue that it encourages a profusion of patents and could merely mire innovation in legal uncertainties and lawsuits.

Foegen doesn't provide any solutions, or even take a strong stance in that debate. For better or worse, *The Tinkerers* feels like a prototype — a bit rough and ready, created as much to point towards interesting questions as to provide answers. To be truly representative, the choice of profiles should at least have included some innovators in biology or medical science, and some working in corporate laboratories. But the hotchpotch does capture a range of approaches and motivations. Kamen seems to like solving problems. Griffith wants to create a greener, smarter world. And although he contributed to the

The Tinkerers: The Amateurs, DIYers, and Inventors Who Make America Great

ALEC FOEGE

Basic Books: 2013.

224 pp. \$26.99

underpinnings of Microsoft Windows, Myhrvold now sees his role in promoting innovation as largely financial and legal.

Foegen's approach contrasts with the

books on innovation that take the 'grand theory of creativity' route, knocking the sharp edges off individual histories to fit them in. Steven Johnson's *Where Good Ideas Come From* (Riverhead, 2010) fits inspiration into seven categories, including hunches and happy accidents. Clayton Christensen's *The Innovator's Dilemma* (Harvard Business School Press, 1997) divvies up the world of innovation according to its impact on business strategy. Fascinating though such books often are, this abstract point of view was more valuable 50 years ago than today.

Then, innovation was managed. Much of it happened in government-funded set-ups such as Bell Labs and DARPA (the US Defense Advanced Research Projects Agency), or at big corporate-funded labs like IBM and Dow Chemical. President Dwight D. Eisenhower, in his 1961 farewell address, worried that "a government contract becomes virtually a substitute for intellectual curiosity". And so powerful were the managers of that funding that he followed his warning about the military-industrial complex with another about the "scientific-technological elite".

Nearly 30 years ago, Steven Levy's book *Hackers* (Anchor/Doubleday, 1984) inspired a generation with the idea that ideas born of subversion are often more powerful than those blessed by management. Today, innovation is popping up all over the place: garages; 'hack-spaces'; bedrooms. Nobody is managing the process. So everybody's story matters.

Few of those stories have yet been told, making those that have the exceptions. One example, Walter Isaacson's biography of Steve Jobs, sparked a global debate about how to manage innovation grounded in life rather than theory. But the exceptions should become the rule. Innovators' histories need to be written. For all its flaws, Foegen's book is a step in the right direction. ■

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